

Pickering, and Pritchard, entering into a searching criticism of them. The sources of error of the most considerable systematic deviations in the results obtained with these instruments were not yet sufficiently known, and it would therefore be well to mark out a number of stars of which thorough observations should be taken by the different observers with the use of all the three instruments.

Prof. Seeliger, of Munich, spoke of theoretical, and in part also practical, investigations he had commenced, which for the present had shown that the Lambert law respecting the reflective power of illumined surfaces, the basis hitherto of all photometric experiments, was entirely false. He reserved his more complete exposition of the matter till the close of his labours in this direction.

Prof. Safarik observed that some astronomers to whom he had communicated his "fluorescence plates," whose intermediate junction of eye-piece annulled the secondary spectrum, had given him a favourable report regarding their use. He was always ready, he said, to place other plates at the disposal of any who desired them.

Prof. Weiss announced that he was engaged in the preparation of a catalogue of 4500 stars which had formerly been observed at Geneva, a catalogue which was now approaching its completion.

President Auwers once more expressed thanks for the friendly reception the Association had met with at Geneva and proposed to the meeting that they should rise from their seats in honour of Col. Gautier. The proceedings were then declared to be concluded.

EDUCATION IN THE UNITED STATES

THE pride taken in popular education in the United States makes any digest of their experience valuable; and education, as carried on in their cities, the subject of a recent Circular of Information from the Bureau of Education, is necessarily the branch of it most interesting in our crowded island. Dr. Philbrick, the writer of it, has been, in Boston, a most successful school superintendent, an officer who undertakes the active duties of both School Board and Government Inspector, and one without whose services cities are here said to be behind the times. The uncertainty of a good choice of members for a School Board by popular election in the United States makes this office the more important; women having, as a rule, declined to counteract corrupt votes by their own. Every branch of education is treated upon here. Technical instruction, both as provided in Paris and in the United States, is largely and systematically considered; from the shape it takes in the school, where it simply replaces the gymnasium to boys over thirteen years of age, to the apprentice school which really attempts to supersede the worn-out system from which it gets its name by a more scientific and intelligent teaching of a few trades, among which building in its various branches, necessarily so important in a new country, is always one chosen. School museums are recommended, both of natural history and of technology; the decoration also of schoolrooms with statuary, &c., now provided for the purpose at low prices, a list of which is appended. The rules to be observed in building are a digest of both European and American experience, valuable to every one concerned with the architecture of schools of any class; and we may just note Dr. Philbrick's conclusions—that increased centralisation and permanency are found desirable; that *speaking* French or German is unnecessary to 90 per cent. of secondary scholars; and that high school education is bad for girls. "Free and uniform" is Dr. Philbrick's ideal. He believes that the work of elementary schools can be so revised that the higher subjects will be a simple continuation of the lower; so that a complete elementary course shall be just the same as the first few years of a university education. Higher stages are never to be commenced till after the age of fourteen. Free high schools, "the most truly democratic of all our institutions," are being used by youths who go back to farm work, contending that in no way does a classical education unfit a man for manual labour and attending meetings of "old boys" whose common interest in the school helps to obliterate social distinctions. Such schools are to be provided for the mechanic to carry on his studies therein in the evening; while for higher students manual labour, especially the use of carpenters' tools, is to replace the gymnasium, and be pursued afterwards in evening technical schools;

and thus study and labour will complement each other, and the daily toil of the poor man is raised to the level of the rich man's recreation. Military and fire drill are to be taught, and replace out-door games. We fear that an elementary course complete in itself and different from university rudiments, although perpetuating class distinctions, will probably be a necessary evil for some time yet, and also that paralysis for lack of competition must be incurred where pupils are required to attend the school in their own district of their own city—this necessitating uniformity of books for the sake of families removing.

A PREHISTORIC CEMETERY

A DUNFERMLINE correspondent writes that another cemetery of prehistoric times has been discovered on the estate of Pitreavie. About two and a half miles to the north-east of the former discovery a number of workmen were, some days ago, engaged in collecting rough stones to form an embankment. Ere the work had proceeded far it was noticed that the stones, which lay on a moor, formed a circle, partly covering a mound 200 feet in diameter. In the centre of the mound, and about 36 inches below the surface, a cyst measuring 46 inches in length and 24 inches in width was found. The cyst was three-parts filled with a dark mould, and in it was discovered a beautifully-formed urn which stands 5 inches in height and measures 6 inches across the mouth. There was nothing in the urn but soil, but in the cyst some large calcined bones were found. Explorations were continued in the vicinity of the cyst and within the stone circle, with the result that no fewer than eleven other urns were found. All these urns contained calcined human bones and much vegetable charcoal, both in dust and in pieces, and numerous pieces of burnt bones were also found in the mound—a circumstance which indicates that a good many interments had taken place without urns. The urns measured from 5 to 12 inches in height, are hand-made, and of the type usually known as "food-vessels." They have everted rims, and are ornamented with varied designs, formed by oblique lines and dots on the upper part, and encircling projecting rings at the bulged part. The urns are of a reddish colour, but the pottery section shows a black interior with a mixture of coarse sand. There are several interesting features attached to the discoveries. In the first cemetery a row of cysts with an urn in each were discovered—circumstances which unmistakably indicate the predominance of inhumation over that of cremation. No bones were found in the urns. In the second discovery only one cyst was found, and eleven of the urns were simply buried in the mounds, and all contained burnt bones—facts suggestive of cremation. The second discovery corresponds more than the first with most of the prehistoric local cemeteries which have been laid bare in the county of Fife. The chronological relationship between the two kinds of interment—inhumation and cremation—as presented to us in the two Pitreavie cemeteries, opens up a most interesting field of inquiry to the enthusiastic archæologist. Dr. Worsaae, the late distinguished archæologist, says cremation was the outcome of higher and more advanced religious principles than characterised the people of the Stone Age, who were in the habit of burying their dead in dolmens and other megalithic tombs, with food-vessels, weapons, ornaments, and such articles as were supposed to be serviceable beyond the grave. Founding upon Dr. Worsaae's idea, it is not unreasonable to assume that the two discoveries under notice belong to the Stone and Bronze ages. The urns are all in the hands of the proprietor of the estate, Mr. Beveridge, and are likely to be handed over to the National Society of Antiquaries.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 8, July 15.—This contains the following:—On the time-relations of the formation of the electric residuum in paraffin, by C. Dieterici.—On the quantity of electrical elementary particles, by E. Budde.—On the theory of thermo-electric forces, by the same.—On a deduction from the laws of electro-dynamic points, suggested by Gauss, by the same.—On some applications of theory of change of form in a body when it is magnetically or dielectrically polarised, by G. Kirchhoff.—Determination of some coefficients of friction and experiments on the influence of magnetisation and electrification on the friction of liquids. The values obtained

from swinging disks were always greater than from an outflow-apparatus. Experiments in which sulphate of manganese solution was let flow from a capillary tube placed between magnetic poles, and others in which the capillary tube, of flint glass coated with shellac, was brought into the field of a condenser (the liquid being sulphide of carbon), showed no alteration of the coefficient of friction.—On the solubility of salt mixtures, by F. Rüchhoff. Of the pairs of salts examined, some were found to be forced from their common solutions when an excess of one or the other salt acted on these, but in other cases only those pairs of salts were forced out which separate from the common solution either in double salts or in mixed crystals.—On the theory of fluorescence, by E. Lommel. He answers some objections of Herr Wüllner to his theory.—Spectral photometric researches on some photographic sensitizers. He finds the sensitising colouring-matters divisible into: (1) those which gradually absorb the spectrum from the violet onwards, and are like the ordinary photographic; (2) those which have a regular absorptive action over great parts of the spectrum from the violet, but photographically show a maximum of sensitisation in the yellow; and (3) those which show an absorption band in the spectrum and a local increase of sensibility to light thereabouts (coincidence not exact).—Correction of new formulæ, by W. Wernicke.—Remarks on Herr Melde's acoustic experimental researches, by A. Else.—Alteration of the influence machine, by E. Lommel. He gets a spark of 12 cm.—On an inaccuracy of the theory of the gold-leaf electroscope, by T. Häbler.

Proceedings of the Boston Society of Natural History, vol. xxiii., part 1.—Mr. Bouvé contributes notes on gems, especially the garnet, hiddenite (an unnamed gem of a light yellow colour, a representative of the mineral spodumene, of which hiddenite is a green variety), and others.—Dr. S. Kneeland read a paper, illustrated by the stereopticon, on the subsidence theory of earthquakes as evidenced by the Ischian catastrophes of 1881 and 1883.—Prof. Crosby has a long paper on the relations of the conglomerate and slate in the Boston Basin; Mr. Bouvé on the genesis of the Boston Basin and its rock formations; Messrs. Dickerman and Wadsworth on an olivine-bearing diabase from St. George, Maine; Prof. Shaler on the origin of kames, a kind of gravel deposit, also known as Eskers, and often called in America, Indian ridges. He supposes that at the close of the glacial period the re-elevation of the land must have been accomplished with very great suddenness.—Finally, Prof. Hyatt contributes a lengthy paper on the larval theory of the origin of cellular tissues.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, September 7.—M. Bouley, President, in the chair.—Researches on isomerism in the aromatic series: Action of the alkalis on the phenols of mixed function, by M. Berthelot.—Studies on the mode of action of the subnitrate of bismuth in the staunching of sores, by MM. Gosselin and Hérat.—Note on the fluorescence of some rare earths, by M. Lecoq de Boisbaudran. The author arrives at conclusions differing in several respects from those of Mr. Crookes, but reserves for the present an exposition of the grounds which induce him to infer that yttria is not the efficient cause of the fluorescence.—On apparent anæsthesia and retarded sensations in hysterical, epileptic, and other nervous subjects, by M. V. Revillont.—Letter announcing the discovery of a new star in the nebula of Andromeda, by M. Lajoie.—Note on the changes recently observed in the nebula of Andromeda, by M. G. Bigourdan.—Observations of Brooks's new comet and of the new planet, 250, made at the Paris Observatory (equatorial of the west tower), by M. G. Bigourdan.—Table of the chief elements of the ten regular polyhedric figures, one illustration, by M. Em. Barbier.—A new map of the solar spectrum, by M. L. Thollion. This work, which has occupied four years of incessant labour at the Observatory of Nice, comprises the whole of the solar spectrum between A and b—that is, about one-third of the prismatic spectrum. It is over ten metres long and includes 3200 lines, or double the number contained in Angström's Atlas. In the preparation of this plan the author's aim has chiefly been to determine as far as possible the present state of the solar spectrum, to serve as a starting-point for future observation. The physicist will by its means be able to record subsequent changes in the spectrum

with the same certainty that the astronomer determines the changes taking place in stellar regions.—Account of the "Ane-mogene," an apparatus invented for generating aerial currents analogous to those of the terrestrial atmosphere, by Mgr. Rougerie, Bishop of Pamier. This instrument takes the form of a miniature globe, which, by rotating around its axis in the air, is made to produce by its mechanical action currents resembling those observed on the greater part of the oceanic basins. The currents are indicated by vanes placed at intervals of 5°, like the compass-cards of the thirty-two winds prepared for the French navy by M. Brault. A list is given of all the trade winds, ascending and descending currents, and other normal atmospheric phenomena reproduced with more or less accuracy by this apparatus.—On the period of latent excitation of some smooth muscles in the invertebrates, by M. Henry de Varigny.—On the so-called "vidian" nerves in birds, by M. F. Rochas.—On the anatomy and vital functions of *Truncatella truncatula*, by M. A. Vayssière.—On the marine annelids of the Bay of Algiers, by M. C. Viguier.—On the anatomical structure of the Ascidians (genera *Saracenia*, *Darlingtonia*, and *Nepenthes*), by MM. Edouard Heckel and Jules Chareyre.—Note on the black rot recently introduced from the United States into the vineyards of Hérault, by MM. P. Viala and L. Ravaz.—On the earthquake-shock felt at Orleans on August 16, by M. E. Renou.—M. H. Gadeau de Kerville announced that he had obtained a hybrid from a tame pigeon and a ring-dove, presenting in a modified form nearly all the special features of both parental types.

September 14.—M. Bouley, President, in the chair.—Discourses pronounced at the obsequies of the late M. Bouquet on September 11, by MM. J. Bertrand and Hermite.—On the fluorescence of some rare earths, continued, by M. Lecoq de Boisbaudran.—Description of the model of a new integrator serving to trace an integral curve ($y = \int f(x) dx + C$), any curve ($y = f(x)$) being given, one illustration, by MM. D. Napoli and Abdank-Abakanowicz. This integrator is capable of numerous applications, and may render great services to the engineer's art. It traces mechanically and with great precision the funicular curves or polygons which play so large a part in the problems of statics. Such problems as the centre of gravity, momenta of inertia, elastic curves and the like, are solved with great rapidity and accuracy.—On submarine countermines, by M. A. Tréve.—On the new star in the nebula of Andromeda. Observations of Brooks' comet made at the Observatory of Paris (equatorial of the West Tower), by M. G. Bigourdan.—Numerical tables intended to facilitate the calculation of the ephemerides of the minor planets, by MM. O. Callandreau and L. Fabry.—On the mixed haloid and other derivatives of methylene, by M. Louis Henry.—On the fermentation of bread-stuffs, by M. Aimé Girard. From numerous researches instituted to determine the true character of the phenomenon by which the dough is changed into bread, the author concludes that the transformation is the result of alcoholic fermentation.—Researches on the morphology and anatomy of ferns, by M. P. Lachmann.—Disposition of the artesian waters in the Wed Rir' and throughout the Lower Sahara in general, by M. G. Rolland. In this paper the author sums up the results of observations continued for a period of six years on the underground supplies in the vast depression of the Shott Melrir in Algeria and Tunis.—Application of the laws of thermo-chemistry to geological phenomena: ores of manganese, by M. Dieulafoy.—Note on a therapeutic operation, to which the name of "dielectrolysis" has been given, by M. A. Broudel.—Trigonometric study of a pyramid whose base is the triangle of Pythagoras, by M. G. Petrowitsch. The sides of the base being respectively related as the number 3, 4, 5, the faces of the pyramid satisfy the relation $3^3 + 4^3 + 5^3 = 6^3$, the number 6 being the measure of the right-angled triangle of the base.

BERLIN

Physiological Society, July 17.—In consequence of a doubt expressed on a former occasion in the Society, Dr. H. Virchow had examined more minutely the eye of the frog, and had come to the conviction that it possessed a beautiful ciliary muscle with long fibres, which, as in the case of all other animals, composed the posterior and outer part of the ciliary body. The ciliary body, as was known, filled out the corner arising from the choroid, which closely adjoined the sclerotic, curving itself round to the iris at the point where the sclerotic passed into the cornea, and, besides the muscle, consisted of